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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/024,518

12/21/2001

Kenneth S. Murphy

MP-332

2151

7590

08/10/2005

Eckert Seamans Cherin & Mellott, LLc  
Alcoa Technical Center  
100 Technical Center Drive  
Alcoa Center, PA 15069-0001

EXAMINER

MCNEIL, JENNIFER C

ART UNIT

PAPER NUMBER

1775

DATE MAILED: 08/10/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

**Application No.**

10/024,518

**Applicant(s)**

MURPHY, KENNETH S.

**Examiner**

Jennifer C. McNeil

**Art Unit**

1775

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 28 April 2005.  
2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.  
3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1 and 3-27 is/are pending in the application.  
4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.  
5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.  
6) ☒ Claim(s) 1,3,4,6-10,12-18,20-22 and 24-26 is/are rejected.  
7) ☒ Claim(s) 5,11,19,23,27 is/are objected to.  
8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.  
10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).  
11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
a) ☐ All b) ☐ Some \* c) ☐ None of:  
1. ☐ Certified copies of the priority documents have been received.  
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.  
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).  
\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)  
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)  
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_.  
4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date \_\_\_\_\_.  
5) ☐ Notice of Informal Patent Application (PTO-152)  
6) ☐ Other: \_\_\_\_\_.

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## DETAILED ACTION

### *Claim Rejections - 35 USC § 102*

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

Claims 1, 3, 4, 7, 8, 9, 10, 13, 14, 15, 16, 17, 18, 20, 21, 22, 24, 25, and 26 are rejected under 35 U.S.C. 102(a) as being anticipated by Zhu et al (Thermal Conductivity of Zirconia and Hafnia Based Thermal barrier coatings; International Conference April 30-May 4, 2001). Zhu teaches a thermal barrier coating comprising zirconia, 30 mol% hafnia, and 4.55 mol% yttria. Zhu teaches an additional embodiment comprising zirconia with 30 mol% hafnia, and 15 mol% yttria. Please see the attached conversion tables for the corresponding wt%, which falls within the claimed ranges. Zhu also teaches the use of bond coatings between the thermal barrier coating and the substrate.

### *Allowable Subject Matter*

Claims 5, 11, 19, 23, and 27 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

### *Response to Arguments*

Applicant's arguments with respect to claims 1, and 3-27 have been considered but are moot in view of the new ground(s) of rejection.

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*Conclusion*

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jennifer C. McNeil whose telephone number is 571-272-1540. The examiner can normally be reached on 9AM-6PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Deborah Jones can be reached on 571-272-1535. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



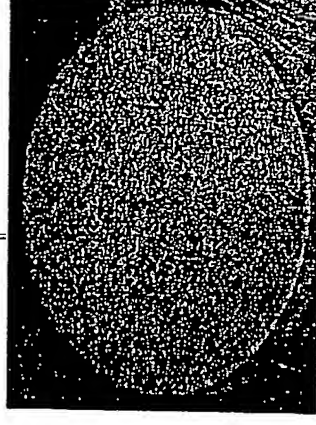
Jennifer McNeil  
Primary Examiner  
August 7, 2005

# Materials and Test Approaches

— Coatings materials:  $\text{ZrO}_2$  and  $\text{HfO}_2$  coatings investigated include:

## A. Plasma-sprayed coatings (in mol%, typically 5-8 mil in thickness)

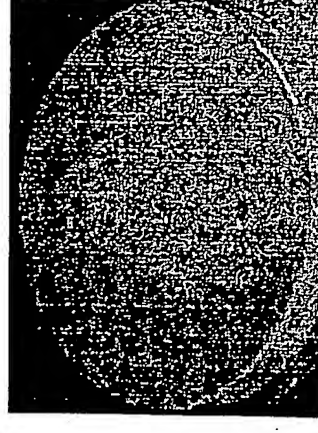
- $\text{ZrO}_2$ -4.55 $\text{Y}_2\text{O}_3$  ( $\text{ZrO}_2$ -8wt% $\text{Y}_2\text{O}_3$ )
- $\text{ZrO}_2$ -30 $\text{HfO}_2$ -4.55 $\text{Y}_2\text{O}_3$
- $\text{ZrO}_2$ -30 $\text{HfO}_2$ -15 $\text{Y}_2\text{O}_3$
- $\text{HfO}_2$ -25.6 $\text{Y}_2\text{O}_3$  ( $\text{HfO}_2$ -27wt% $\text{Y}_2\text{O}_3$ )
- $\text{ZrO}_2$ -30 $\text{Y}_2\text{O}_3$



Plasma-sprayed  
coating specimen

## B. EB-PVD coatings

- $\text{ZrO}_2$ -4.55 $\text{Y}_2\text{O}_3$  ( $\text{ZrO}_2$ -8wt% $\text{Y}_2\text{O}_3$ )
- $\text{ZrO}_2$ -31.5 $\text{HfO}_2$ -14.7 $\text{Y}_2\text{O}_3$
- $\text{HfO}_2$ -25.6 $\text{Y}_2\text{O}_3$  ( $\text{HfO}_2$ -27wt% $\text{Y}_2\text{O}_3$ )



EB-PVD specimen

— NiCrAlY and PtAl bond coats used

— 25.4 mm-diameter and 3.2mm-thick Rene'N5 or other Ni-based superalloy disks used as substrates

— Laser thermal conductivity tested at 1316°C (2400°F)



	MW	wt% Ex 1	wt% Ex 2	wt% Ex 3	wt% Ex 4	wt% Ex 5	wt% Ex 6	wt% Ex 7	wt% Ex 8	wt% Ex 9	wt% Ex 10	mol% Ex 1	mol% Ex 2	mol% Ex 3	mol% Ex 4	mol% Ex 5	mol% Ex 6	mol% Ex 7	mol% Ex 8	mol% Ex 9	mol% Ex 10	
SiO2	60	0.0	#####	#####	#####	#####	#####	#DIV/0!	#DIV/0!	#####	#####											SiO2
B2O3	70	0.0	#####	#####	#####	#####	#####	#DIV/0!	#DIV/0!	#####	#####											B2O3
P2O5	142	0.0	#####	#####	#####	#####	#####	#DIV/0!	#DIV/0!	#####	#####											P2O5
GeO2	104	0.0	#####	#####	#####	#####	#####	#DIV/0!	#DIV/0!	#####	#####											GeO2
Al2O3	102	0.0	#####	#####	#####	#####	#####	#DIV/0!	#DIV/0!	#####	#####											Al2O3
Li2O	30	0.0	#####	#####	#####	#####	#####	#DIV/0!	#DIV/0!	#####	#####											Li2O
Na2O	62	0.0	#####	#####	#####	#####	#####	#DIV/0!	#DIV/0!	#####	#####											Na2O
K2O	94	0.0	#####	#####	#####	#####	#####	#DIV/0!	#DIV/0!	#####	#####											K2O
MgO	40	0.0	#####	#####	#####	#####	#####	#DIV/0!	#DIV/0!	#####	#####											MgO
CaO	56	0.0	#####	#####	#####	#####	#####	#DIV/0!	#DIV/0!	#####	#####											CaO
SrO	104	0.0	#####	#####	#####	#####	#####	#DIV/0!	#DIV/0!	#####	#####											SrO
BaO	153	0.0	#####	#####	#####	#####	#####	#DIV/0!	#DIV/0!	#####	#####											BaO
ZnO	81	0.0	#####	#####	#####	#####	#####	#DIV/0!	#DIV/0!	#####	#####											ZnO
PbO	224	0.0	#####	#####	#####	#####	#####	#DIV/0!	#DIV/0!	#####	#####											PbO
ZrO2	122	52.1	#####	#####	#####	#####	#####	#DIV/0!	#DIV/0!	#####	#####	65.4										ZrO2
TiO2	80	0.0	#####	#####	#####	#####	#####	#DIV/0!	#DIV/0!	#####	#####											TiO2
CeO2	172	0.0	#####	#####	#####	#####	#####	#DIV/0!	#DIV/0!	#####	#####											CeO2
Sb2O3	291	0.0	#####	#####	#####	#####	#####	#DIV/0!	#DIV/0!	#####	#####											Sb2O3
SnO2	151	0.0	#####	#####	#####	#####	#####	#DIV/0!	#DIV/0!	#####	#####											SnO2
MoO3	146	0.0	#####	#####	#####	#####	#####	#DIV/0!	#DIV/0!	#####	#####											MoO3
Fe2O3	160	0.0	#####	#####	#####	#####	#####	#DIV/0!	#DIV/0!	#####	#####											Fe2O3
Pr2O3	330	0.0	#####	#####	#####	#####	#####	#DIV/0!	#DIV/0!	#####	#####											Pr2O3
La2O3	326	0.0	#####	#####	#####	#####	#####	#DIV/0!	#DIV/0!	#####	#####											La2O3
Y2O3	226	6.7	#####	#####	#####	#####	#####	#DIV/0!	#DIV/0!	#####	#####	4.6										Y2O3
Er2O3	380	0.0	#####	#####	#####	#####	#####	#DIV/0!	#DIV/0!	#####	#####											Er2O3
Yb2O3	396	0.0	#####	#####	#####	#####	#####	#DIV/0!	#DIV/0!	#####	#####											Yb2O3
Ta2O5	442	0.0	#####	#####	#####	#####	#####	#DIV/0!	#DIV/0!	#####	#####											Ta2O5
Nb2O5	266	0.0	#####	#####	#####	#####	#####	#DIV/0!	#DIV/0!	#####	#####											Nb2O5
Nb2O3	234	0.0	#####	#####	#####	#####	#####	#DIV/0!	#DIV/0!	#####	#####											Nb2O3
Nd2O3	332	0.0	#####	#####	#####	#####	#####	#DIV/0!	#DIV/0!	#####	#####											Nd2O3
CuO	79	0.0	#####	#####	#####	#####	#####	#DIV/0!	#DIV/0!	#####	#####											CuO
CoO	75	0.0	#####	#####	#####	#####	#####	#DIV/0!	#DIV/0!	#####	#####											CoO
NiO	74	0.0	#####	#####	#####	#####	#####	#DIV/0!	#DIV/0!	#####	#####											NiO
MnO2	87	0.0	#####	#####	#####	#####	#####	#DIV/0!	#DIV/0!	#####	#####											MnO2
Gd2O3	364	0.0	#####	#####	#####	#####	#####	#DIV/0!	#DIV/0!	#####	#####											Gd2O3
F2	175	0.0	#####	#####	#####	#####	#####	#DIV/0!	#DIV/0!	#####	#####											F2
As2O3	198	0.0	#####	#####	#####	#####	#####	#DIV/0!	#DIV/0!	#####	#####											As2O3
HfO2	210	41.2	#####	#####	#####	#####	#####	#DIV/0!	#DIV/0!	#####	#####	30.0										SO3
		100.0	#####	#####	#####	#####	#####	#DIV/0!	#DIV/0!	#####	#####	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0